

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions and listings of claims in the application:

91. (Previously Presented) A surface position detection device for detecting a surface position of a detection target surface, comprising:

a projection system, optically connected to the detection target surface, for projecting a light beam along an oblique direction onto the detection target surface;

a light-receiving system, optically connected to the detection target surface, for receiving a light beam reflected by the detection target surface;

a light beam deflector, provided, at least, either in an optical path of the projection optical system or in an optical path of the light-receiving system, having an even number of reflection surfaces to allow an incident light beam to exit at an angle that is not parallel to an entry angle of the incident light beam,

wherein the surface position of the detection target surface is detected based upon an output from the light-receiving system.

92. (Previously Presented) The surface position detection device of claim 91, wherein the light beam deflector includes a prism having a pairing of reflection surfaces that are not parallel to each other.

93. (Previously Presented) The surface position detection device of claim 92, wherein the prism includes:

a first transmission surface through which the incident light beam is transmitted;
a first reflection surface at which the light beam; having been transmitted through the first transmission surface and propagated through an inside of the prism, is reflected;

a second reflection surface, at which the light beam having been reflected at the first reflection surface and propagated through the inside of the prism, is reflected along an optical path intersecting an optical path of the light beam having been transmitted through the first transmission surface;

and a second transmission surface through which the light beam, having been reflected at the second reflection surface and propagated through the inside of the prism, is transmitted.

94. (Previously Presented) The surface position detection device of claim 93, wherein an angle formed by the first and second reflection surfaces is set within a range of 40° or more and less than 45°.

95. (Previously Presented) The surface position detection device of claim 94, wherein the prism comprises a low-dispersion optical material with an Abbe number of 65 or higher.

96. (Previously Presented) The surface position detection device of claim 94, wherein the prism comprises a low thermal expansion optical material with a thermal expansion coefficient equal to or lower than 1ppm/K.

97. (Previously Presented) The surface position detection device of claim 92, wherein the prism comprises a low-dispersion optical material with an Abbe number of 65 or higher.

98. (Previously Presented) The surface position detection device of claim 92, wherein the prism comprises a low thermal expansion optical material with a thermal expansion coefficient equal to or lower than 1ppm/K.

99. (Previously Presented) The surface position detection device of claim 91, wherein the light beam deflector includes a pair of reflection mirrors, and a holding member mechanically connected to the pair of reflection mirrors.

100. (Previously Presented) The surface position detection device of claim 99, wherein the pair of reflection mirrors reflect the incident light beam along an optical path intersecting an optical path of the incident light beam.

101. (Previously Presented) The surface position detection device of claim 100, wherein the holding member comprises a low thermal expansion with a thermal expansion coefficient equal to or lower than 1 ppm/K.

102. (Previously Presented) The surface position detection device of claim 99, wherein the holding member comprises a low thermal expansion material with a thermal expansion coefficient equal to or lower than 1ppm/K.

103. (Previously Presented) The surface position detection device of claim 91, wherein the reflection surfaces of the light beam deflector reflect the incident light beam along an optical path intersecting an optical path of the incident light beam.

104. (Currently Amended) An exposure apparatus for exposing a pattern onto a photosensitive substrate, comprising:

a surface position detection device for detecting a surface position of the photosensitive substrate, comprising:

a projection system, optically connected to the photosensitive substrate, for projecting a light beam along an oblique direction onto the photosensitive substrate;

a light-receiving system, optically connected to the photosensitive substrate, for receiving a light beam reflected by the photosensitive substrate;

a light beam deflector, provided, at least, either in an optical path of the projection optical system or in an optical path of the light-receiving system, having an even number of reflection surfaces to allow an incident light beam to exit at an angle that is not parallel to an entry angle of the incident light beam,

wherein the surface position of the photosensitive substrate is detected based upon an output from the light-receiving system;

~~the surface position detection device of claim 91, optically connected to the~~
~~photosensitive substrate;~~
a surface holder; and
a controller,
wherein the controller controls a position of the substrate holder based upon an
output from the surface position detection device.

105. (Currently Amended) A method for exposing a pattern onto a substrate,
comprising:

detecting a position of the substrate with ~~the surface position detection device of~~
~~claim 91;~~ a surface position detection device that includes:

a projection system, optically connected to substrate, for projecting a light
beam along an oblique direction onto the substrate;

a light-receiving system, optically connected to the substrate, for receiving
a light beam reflected by the substrate;

a light beam deflector, provided, at least, either in an optical path of the
projection optical system or in an optical path of the light-receiving system, having an
even number of reflection surfaces to allow an incident light beam to exit at an angle
that is not parallel to an entry angle of the incident light beam,

wherein the position of the substrate is detected based upon an output
from the light-receiving system;

controlling the position of the substrate based upon an output from the surface
position detection device; and

exposing the pattern onto the substrate.

106. (Currently Amended) A method for detecting a surface position of a detection target comprising:

projecting a light beam along an oblique ~~directing~~ direction onto the detection target surface;

receiving a light beam reflected by the detection target surface;

deflecting at least either one of an optical path of the projected light beam or an optical path of the received light beam with an even number of reflection surfaces to allow an incident light beam to exit at an angle that is not parallel to an entry angle of the incident light beam; and

detecting the surface position of the detection target based upon the received light beam.

107. (Previously Presented) The method of claim 106, wherein the reflection surfaces reflect the incident light beam along an optical path intersecting an optical path of the incident light beam.

108. (Previously Presented) The method of claim 107, wherein the reflection surfaces are formed on a prism.

109. (Previously Presented) The method of claim 108, wherein the prism comprises a low-dispersion optical material with an Abbe number of 65 or higher.

110. (Previously Presented) The method of claim 108, wherein the prism comprises a low thermal expansion material with a thermal expansion coefficient equal to or lower than 1ppm/K.

111. (Previously Presented) The method of claim 107, wherein the reflection surfaces are formed on surfaces of mirrors which are held by a holding member.

112. (Previously Presented) The method of claim 111, wherein the holding member comprises a low thermal expansion material with a thermal expansion coefficient equal to or lower than 1ppm/K.

113. (Previously Presented) The method of claim 107, wherein an angle formed by the reflection surfaces is set within a range of 40° or more and less than 45°.

114. (Currently Amended) A method of exposing a pattern onto a substrate, comprising:

~~detecting a position of the substrate with the method of claim 106 using a detecting device;~~

projecting a light beam along an oblique direction onto the substrate;

receiving a light beam reflected by the substrate;

deflecting at least either one of an optical path of the projected light beam or an optical path of the received light beam with an even number of reflection surfaces to

allow an incident light beam to exit at an angle that is not parallel to an entry angle of the incident light beam; and

detecting the surface position of the substrate based upon the received light beam;

controlling the position of the substrate based upon an output from the detecting device; and

exposing the pattern onto the substrate.

115. (Currently Amended) ~~The surface position detection device of claim 95~~ A surface position detection device for detecting a surface position of a detection target surface, comprising:

a projection system, optically connected to the detection target surface, for projecting a light beam along an oblique direction onto the detection target surface;

a light-receiving system, optically connected to the detection target surface, for receiving a light beam reflected by the detection target surface;

a light beam deflector, provided, at least, either in an optical path of the projection optical system or in an optical path of the light-receiving system, having an even number of reflection surfaces to allow an incident light beam to exit at an angle that is not parallel to an entry angle of the incident light beam,

wherein:

the surface position of the detection target surface is detected based upon an output from the light-receiving system,

the light beam deflector includes a prism having a pairing of reflection surfaces that are not parallel to each other,

the prism includes:

a first transmission surface through which the incident light beam is transmitted;

a first reflection surface at which the light beam; having been transmitted through the first transmission surface and propagated through an inside of the prism, is reflected;

a second reflection surface, at which the light beam having been reflected at the first reflection surface and propagated through the inside of the prism, is reflected along an optical path intersecting an optical path of the light beam having been transmitted through the first transmission surface;

and a second transmission surface through which the light beam, having been reflected at the second reflection surface and propagated through the inside of the prism, is transmitted,

an angle formed by the first and second reflection surfaces is set within a range of 40° or more and less than 45°,

the prism comprises a low-dispersion optical material with an Abbe number of 65 or higher, and ,wherein

the projection system comprises an oscillating mirror arranged in the optical path of the projection system or in the optical path of the light-receiving system.

116. (Previously Presented) The surface position detection device of claim 91, wherein the even number of reflection surfaces are arranged in at least one of an optical path between a the detection target surface and a side lens surface of the projection system and an optical path between the detection target surface and a side lens surface of the light-receiving system.

117. (Previously Presented) The surface position detection device of claim 116, wherein the projection system and the light-receiving system has detection target side telecentricity.

118. (Previously Presented) The surface position detection device of claim 117, wherein the projection system projects an image of a pattern onto the detection target surface.

119. (Currently Amended) An exposure apparatus for exposing a pattern onto a photosensitive substrate, the exposure apparatus comprising:

a surface position detection device for detecting a surface position of the photosensitive substrate, including:

a projection system, optically connected to the photosensitive substrate, for projecting a light beam along an oblique direction onto the photosensitive substrate;

a light-receiving system, optically connected to the photosensitive substrate, for receiving a light beam reflected by the photosensitive substrate;

a light beam deflector, provided, at least, either in an optical path of the projection optical system or in an optical path of the light-receiving system, having an even number of reflection surfaces to allow an incident light beam to exit at an angle that is not parallel to an entry angle of the incident light beam,

wherein the surface position of the photosensitive substrate is detected based upon an output from the light-receiving system, the even number of reflection surfaces are arranged in at least one of an optical path between a the detection target surface and a side lens surface of the projection system and an optical path between the detection target surface and a side lens surface of the light-receiving system, and the projection system and the light-receiving system has detection target side telecentricity;

~~the surface position detection device of claim 117, optically connected to the photosensitive substrate;~~

a substrate holder; and

a controller, wherein the controller controls a position of the substrate holder based upon an output from the surface position detection device.

120. (Currently Amended) A method for exposing a pattern onto a substrate, comprising:

detecting a position of the substrate with ~~the surface position detection device of claim 117;~~

a surface position detection device that includes:

a projection system, optically connected to the substrate, for projecting a light beam along an oblique direction onto the substrate;

a light-receiving system, optically connected to the substrate, for receiving a light beam reflected by the substrate;

a light beam deflector, provided, at least, either in an optical path of the projection optical system or in an optical path of the light-receiving system, having an even number of reflection surfaces to allow an incident light beam to exit at an angle that is not parallel to an entry angle of the incident light beam,

wherein the surface position of the substrate is detected based upon an output from the light-receiving system, the even number of reflection surfaces are arranged in at least one of an optical path between a the detection target surface and a side lens surface of the projection system and an optical path between the detection target surface and a side lens surface of the light-receiving system, and the projection system and the light-receiving system has detection target side telecentricity;

controlling the position of the substrate based upon an output from the surface position detection device; and

exposing the pattern onto the substrate.

121. (Previously Presented) The method of claim 109, wherein at least one of the step of projecting the light beam and the step of receiving the light beam comprises a step of oscillating the light beam.

122. (Previously Presented) The method of claim 106, wherein the step of deflecting the optical path is performed between the step of projecting the light beam and the step of receiving the light beam.

123. (Previously Presented) The method of claim 122, wherein the step of projecting the light beam comprises a step of projecting an image of a pattern onto the detection target surface.